Morten Kjeldsen

Daglig leder, PhD

I jobben min undersøker og utvikler jeg nye muligheter og løsninger for FDB men også sammen med andre partnere. Jeg bruker min fagkompetanse på eksisterende produkter og tjenester, og jeg er engasjert i FDB sin salgs og markedsføringsarbeid.

Som ingeniør bruker jeg verktøy som 3D og 1D CFD, blant annet Ansys Fluent, Flomaster og LVTrans, for å evaluere oppførsel på strømningssystemer og komponenter. I tillegg bruker jeg NI LabVIEW for analyse av data fra målinger. Jeg prøver alltid å følge opp med analytiske og teoretiske modeller for oppgavene jeg løser.

Arbeidserfaring

- CEO and R&I manager, Flow Design Bureau AS (2002->)
- Associate Professor NTNU (1.2007-7.2009)
- Associate Professor at NTNU Hydropower lab.(1999-2000)
- Research associate at Uof Minnesota- St Anthony Falls Laboratory (1997-1998)
- Dr.fellow at NTNU. Mech Eng. (1992-1996)

Utdannelse

- Dr. Ing. "Cavitation in Hydraulic Machinery" , NTNU (1996)
- Master of Science in Mechanical Engineering, NTNU (2011)

Kompetanse

- Analytical modelling (of flow systems) 95%
- Data analysis 90%
- Numerical modelling 90%
- Management 90%

Profesjonell kompetanse

- Flomaster
- Ansys CFD
- NI LabVIEW
- LVTrans
- Acad

Publications

Cavitation highlights

- Marschall, Mørch, Keller & Kjeldsen "Cavitation inception by almost spherical solid particles in water", Physics of Fluids, Vol.15, no2, 2003. Conceptual idea by MK. Laboratory works in TUM Obernach, Germany (Marschall & Keller) and DTU, Lyngby, Denmark (Mørch).

- Kjeldsen, Arndt & Efferz "Spectral Characteristics of Sheet/Cloud Cavitation", ASME- JFE, 2000. Summary of work on transient loads from cavitation.

- Escaler, Ekanger, Francke, Kjeldsen and Nielsen "Detection of Draft Tube Surge and Erosive Blade Cavitation in a Full-Scale Francis Turbine", ASME-JFE, 2015. Covering Industrial PhD (Ekanger) and work on developing the FDB cavitation monitoring system.

Industrial relevant publication

- Analysis using empirical relations, 1D system simulation tools (Flomaster) and 3D heat and flow analysis tools. See: *Transient modeling of riser load control: Technology qualification using CAE and physical tests.* CAE Conference 2016. Full copy available upon request.

Portefølje

Litro

NTNU/FDB, 2019

LiTRo is a joint research project with the Norwegian University of Science and Technology (NTNU). It consisted of the design and manufacturing of a mobile test rig for investigating the Lifting and Transportation mechanisms of rocks and sand (hence the name: **Li**ft and **T**ransportation of **Ro**cks).

▲ About the project

The test rig was designed as a closed loop pump system, with a lower reservoir, a surge shaft, and upper reservoir, and a transparent rectangular test-section placing rock and sand specimens. The rig also included a measurement cabinet that monitored and measured rig parameters such as flow rate, pressure, surge shaft level, and valve positions. The rig is built within a large shipping container, with the upper reservoir residing on top of the container when rigged up for use. The surge shaft also protruded from the top of the container, and the pipe section upstream the test section exited and reentered the container, allowing for a long straight section for achieving fully developed flow.

My role:
Project idea and definition.
Head analysis...

Diffcon

NTNU/FDB, 2004

Draft tube water injection system for the mitigation of pressure pulsations.

▲ About the project

Together with Norwegian power companies, FDB has been developing DiffCon since 2004. This partnership has continued and DiffCon is now being developed by FDB in collaboration with Statkraft. The basic principle is that the system tries to control the total rotation within the hydro turbine draft tube. The total rotation is defined as the integral value of the product of tangential and axial velocity over the cross-sectional area. The flow becomes naturally unstable for given load settings and where large vortices and pressure pulsations dominate. By injecting water at high speed into the draft tube, this instability is mitigated and resulting in a calmer machine.

My role:
Numerous projects.
Conceptual idea and project leader.

AFC4Hydro

EU Horizon 2020

The overall objective of the AFC4Hydro research project is to design, implement and validate in full-scale water turbine an active flow control system that permit to increase efficiency and reduce the dynamics loads on the structure at any off-design operating conditions and during transient operations.

▲ About the project

Specifically, the system will modify the draft tube flow field to mitigate or supress the pressure fluctuations induced by the vortical flow which limits the operation of actual hydraulic machines. Special attention will be given to the flow instability leading to the formation of the vortex rope in the draft tube.
A combination of two innovative technologies will be used in the draft tube:

1. injection of pulsating momentum (IPM) with a specific frequency, amplitude and phase by means of actuators;
2. injection of continuous momentum (ICM) in the form of water jets with controlled speed and orientation directed against the swirling flow.

The IPM handles the problem at its source, while the ICM is the remedy when the problem arises. A structural health monitoring (SHM) system will be developed to continuously evaluate the performance of the turbine in real time and used as a feedback to adjust the flow control strategy with a specifically designed Controller. This closed loop configuration will permit to enhance the stability of the flow and decrease the level of unsteadiness also during transients such as ramp up and ramp down.

My role:
Project definition and WP leader.

Andre prosjekter

- Industrial PhDs: Project definitions and supervision.
- Subsea heat transfer: Engaged is tasks for Gullfaks, Aasgard and Ormen Lange three major subsea projects on the Norwegian continental shelf. 3D CFD and development of models for use in other SW. Experimental program for investigating the effect of gas-carry-over on liquid pump boost.
- Associate professor @NTNU. Main responsibility for one PhD student, several Master students and Master level course on Industrial Fluid Power.
- Associate professor @NTNU. Lectures and MSc supervision. Research and hydraulic design for tidal turbine prototype by Hammerfest Strøm. Installed in Kvalsundet in Northern Norway.
- Head experimentalist at the UMN St.Anthony Falls Laboratory cavitation tunnel, and for a ONR (Office of Naval Research- US Navy) funded studies on dynamics of cavitation.